Materials Engineering Branch

TIP*

No. 061 Technique for Trapping Particulates in Closed Containers

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As conscientious as one might be about removing all particulate debris from flight hardware, it has not been uncommon to find both metallic and non-metallic debris lying on the bottom of black boxes that were opened for inspection subsequent to vibrational or acoustical testing. In such cases, the particulates can be readily removed and the threat of associated problems is eliminated.

However, many electronic boxes (already integrated into spacecraft systems) are never opened for inspection after vibrational or acoustical testing. Consequently, there is a certain amount of apprehension associated with such hardware, especially if it contains electronics that are not conformally coated, or moving components such as gears, belts, magnetic tape, etc. In some known cases it has been positively determined that failure of flight hardware was the result of debris that became dislodged subsequent to environmental testing. Any loose debris, when exposed to a zero-G environment, can cause failure to certain kinds of hardware.

One such failure occurred in a tape recorder on a Shuttle flight. Investigation of the failed recorder revealed that a loose flat metal washer had apparently been dropped into the recorder. For whatever reason, the loose washer that had become lodged somewhere inside the recorder was never removed prior to replacing the recorder cover. Subsequently, when the tape recorder was operated in the zero-G space environment, the washer found its way to the magnetic tape causing it to tear and resulting in a tape recorder failure.

To reduce the possibility of such failures, primarily in flight hardware which may never be opened for inspection after vibration testing and before launch, the hardware cognizant personnel should consider placing a low outgassing

transfer film adhesive or a two-sided adhesive tape on the inside surface of the box cover, or on some other more desirable surface depending on the hardware configuration, to act as a trap for such debris, especially if particulate matter of any kind could result in hardware failure. Possible transfer film adhesive tapes or two-sided adhesive tapes for consideration in such an application are: 3M-966, 3M-967, 3M-9460 transfer film adhesive tapes or Temp-R-Tape M-69 and 3M-1255 two-sided adhesive tapes.